

CLAIMS

1. An apparatus, comprising:
 - a fuel cell for producing a flow of electric charges from a fuel;
 - an electric charge counter coupled with the fuel cell, wherein counted electric charges are proportional to an amount of the fuel used in the fuel cell to produce the counted electric charges; and
 - a display coupled with the electric charge counter to show an amount of the fuel based on corresponding counted electric charges.
2. The apparatus as recited in claim 1, wherein the display shows an amount of fuel used by the fuel cell based on the counted electric charges.
3. The apparatus as recited in claim 1, further comprising a fuel supply, wherein the display shows an amount of fuel remaining in the fuel supply after subtracting the amount of fuel corresponding to the counted electric charges.
4. The apparatus as recited in claim 1, wherein the electric charge counter counts electric charges by integrating the flow of electric charges with respect to time.
5. The apparatus as recited in claim 4, wherein the electric charge counter counts electric charges by measuring a voltage proportional to a flow rate of the electric charges and assigns a frequency to the voltage.
6. The apparatus as recited in claim 5, wherein the electric charge counter varies the frequency in proportion to changes in the flow rate of the electric charges over time.

7. The apparatus as recited in claim 6, wherein the electric charge counter increments the count of the electric charges at an incrementing rate proportional to the frequency.

8. The apparatus as recited in claim 1, wherein the electric charge counter includes an interpreter to determine a proportionality factor between the counted electric charges and the amount of fuel used to produce the counted electric charges.

9. The apparatus as recited in claim 8, further comprising a temperature compensator, wherein the amount of fuel shown on the display is corrected for a temperature if the temperature affects the proportionality between the quantity of counted electric charges and the amount of fuel used to produce the counted electric charges.

10. The apparatus as recited in claim 8, further comprising a pressure compensator, wherein the amount of fuel shown on the display is corrected for a pressure if the pressure affects the proportionality between the quantity of counted electric charges and the amount of fuel used to produce the counted electric charges.

11. The apparatus as recited in claim 8, further comprising a fuel loss compensator, wherein the amount of fuel shown on the display is corrected if a fuel loss affects the proportionality between the quantity of counted electric charges and the amount of fuel used to produce the counted electric charges.

12. The apparatus as recited in claim 8, further comprising a fuel mix compensator, wherein the amount of fuel shown on the display is corrected if a fuel mix affects the proportionality between the quantity of counted electric charges and the amount of fuel used to produce the counted electric charges.

13. The apparatus as recited in claim 8, further comprising a self-calibrator to determine, while counting electric charges during fuel use, the proportionality between the counted electric charges and the amount of fuel used to produce the counted electric charges.

14. The apparatus as recited in claim 13, wherein the self-calibrator performs automatic determination of the proportionality.

15. The apparatus as recited in claim 8, further comprising a fuel comparator to determine electric charge counts for equivalent amounts of different types of fuel.

16. A fuel cell, comprising:

a means for converting a fuel into a flow of electric charges, wherein the quantity of electric charges produced over time is proportional to the quantity of fuel molecules converted;

a means for counting the electric charges in the flow; and

a means for displaying an amount of fuel molecules converted.

17. The fuel cell as recited in claim 16, wherein the means for displaying shows the amount of fuel molecules converted as an amount of fuel from a fuel supply.

18. The fuel cell as recited in claim 17, wherein the means for displaying shows the amount of molecules converted as an amount of fuel remaining in a fuel supply.

19. The fuel cell as recited in claim 16, wherein the means for counting the electric charges integrates the flow of electric charges with respect to time.

20. The fuel cell as recited in claim 19, wherein the means for counting the electric charges measures a voltage proportional to a flow rate of the electric charges and assigns a frequency to the voltage.

21. The fuel cell as recited in claim 20, wherein the electric charge counter varies the frequency in proportion to changes in the flow rate of electric charges over time.

22. The fuel cell as recited in claim 21, wherein the electric charge counter increments the count of the electric charges at an incrementing rate proportional to the frequency.

23. The fuel cell as recited in claim 16, wherein the means for counting electric charges measures an overall power output of the fuel cell over time when connected to a particular electrical load and correlates the overall power output of the fuel cell over time to the quantity of fuel molecules converted using an efficiency factor of the fuel cell when connected to the particular electrical load.

24. The fuel cell as recited in claim 16, wherein the means for counting electric charges includes a means for determining a proportionality between the count of the electric charges and the quantity of fuel molecules converted.

25. The fuel cell as recited in claim 24, wherein the means for determining a proportionality further comprises a temperature compensator.

26. The fuel cell as recited in claim 24, wherein the means for determining a proportionality further comprises a pressure compensator.

27. The fuel cell as recited in claim 24, wherein the means for determining a proportionality further comprises a fuel loss compensator.

28. The fuel cell as recited in claim 24, wherein the means for determining a proportionality further comprises a fuel mix compensator.

29. The fuel cell as recited in claim 24, wherein the means for determining a proportionality further comprises a self-calibrator to determine the proportionality while counting electric charges during fuel use.

30. The fuel cell as recited in claim 29, wherein the self-calibrator performs automatic determination of the proportionality.

31. The fuel cell as recited in claim 16, further including a fuel comparator to determine electric charge counts from equivalent amounts of different types of fuel.

32. A fuel supply system, comprising:

a fuel container for holding a remaining amount of fuel;

an electric charge counter to count an electric charge content of an amount of fuel taken from the fuel container, wherein the count of the electric charge content is proportional to the amount of the fuel taken from the fuel container; and

a display to show the remaining amount of fuel in the fuel container.

33. The fuel supply system as recited in claim 32, wherein the electric charge content is counted during oxidation of the fuel by a fuel cell.

34. The fuel supply system as recited in claim 32, wherein the fuel comprises fuel molecules, and each fuel molecule contributes a constant number of electric charges to the count of the electric charge content.

35. A fuel gauge, comprising:

a charge counter to count electrical charges produced in a fuel cell by a fuel from a fuel supply; and

a display to show an amount of the fuel based on the counted electrical charges.

36. The fuel gauge as recited in claim 35, wherein the amount of the fuel displayed is an amount of the fuel that has been used from the fuel supply.

37. The fuel gauge as recited in claim 35, wherein the amount of the fuel displayed is an amount of the fuel remaining in the fuel supply.

38. A count interpreter for a charge counting fuel gauge, comprising:
a count calibrator; and
a fuel loss compensator.

39. The count interpreter as recited in claim 38, wherein the count calibrator further includes a temperature compensator to adjust a display of a fuel amount if a charge count is affected by a temperature.

40. The count interpreter as recited in claim 38, wherein the count calibrator further includes a pressure compensator to adjust a display of a fuel amount if a charge count is affected by a pressure.

41. The count interpreter as recited in claim 38, wherein the count calibrator further includes a fuel mix compensator to adjust a display of a fuel amount if a charge count is affected by a fuel mix.

42. The count interpreter as recited in claim 38, wherein the fuel loss compensator adjusts a fuel amount to be displayed by an amount of fuel that does not contribute to a charge count.

43. The count interpreter as recited in claim 38, further comprising a self-calibrator to find a relationship between an amount of fuel and a quantity of

electric charges counted during use of a fuel that produces electric charges in a fuel cell.

44. The count interpreter as recited in claim 38, further comprising a fuel comparator to determine a quantity of electric charges yielded by same amounts of different fuels.

45. A method, comprising:

producing electric charges in a fuel cell using a fuel;

counting the electric charges to determine an amount of the fuel used to produce the electric charges; and

displaying the amount.

46. The method as recited in claim 45, wherein the producing electric charges using a fuel includes producing a number of electric charges for each molecule of fuel, wherein the number is a constant.

47. The method as recited in claim 45, wherein the electric charges are obtained from an oxidation reaction of the fuel.

48. A method, comprising:

connecting an electric charge counter to a fuel cell, wherein the fuel cell produces electric charges from a fuel;

counting the electric charges; and

displaying an amount of fuel corresponding to the counted electric charges.

49. The method as recited in claim 48, further comprising displaying an amount of fuel remaining in a fuel supply after an amount of fuel corresponding to the counted electric charges has been subtracted from the fuel supply.

50. The method as recited in claim 48, further comprising determining a proportionality factor between a quantity of the counted electric charges and an amount of fuel used by the fuel cell.